Articles

Pedaling Into the Future

Marcia D. Lowe

The bicycle has the potential to help free the cities of the world from choking on the pollution and traffic congestion of the automobile, and to offer short-range, individualized travel at a low cost to the billions who will never be able to afford a car. A growing number of nations are realizing that in a world of finite resources--petroleum, land, and clean air--the bicycle is the vehicle of the future.

Traffic noise in Beijing means the whirring of bicycle wheels and tinkling of bells. The streets of New Delhi come alive with thousands of bicycle commuters each day. Office workers in New York City depend on bicycle messengers to cruise past bumper-to-bumper traffic and deliver parcels on time. And police officers in Seattle often find bicycles better than squad cars for apprehending criminals on gridlocked downtown streets.

Outside the city, bicycles also play a vital role. Kenyan dairy farmers cycle through remote regions with milk deliveries, and Nicaraguan health workers on bikes now reach four times as many rural patients as they did on foot.

Whether a cycle rickshaw in Jakarta or a ten-speed in Boston, pedal power plays a key role in transportation. The bicycle is fast becoming the only way to move quickly through congested urban traffic, and the only affordable personal transport in the developing world, where an automobile may cost more than a worker earns in a decade.

Despite its demonstrated utility, the bicycle has been formally neglected by transport planners in almost every country on the globe. Only China and a few Western European nations collect transportation data that count bicycles among forms of transport. In the case of the United States Department of Commerce, neglect might be a promotion in status for the bicycle; the department refers inquiries on bicycle trade to its Division of Toys and Games.

The World Bank, the main source of urban transport investment in the developing world, published a 1985 study on the Chinese transport sector that does not even mention the word bicycle, although the overwhelming majority of trips in China's cities are made by bike. This is sadly typical of a policy environment in which only motor vehicles are taken seriously.

High Price for Mobility

The automobile has long been considered the vehicle of the future. Indeed, it has brought industrial society into the modern age with a degree of individual mobility and convenience not known before. But overreliance on the car is backfiring as too many cars clutter city streets and highways, bringing rush-hour traffic to a standstill. The side effects of massive oil use show up not only in economy-draining import bills but in deadly air pollution in cities, acid rain in dying lakes and forests, and hastened global warming.

In their enthusiasm for engine power, transport planners have overlooked the value of human power. With congestion, pollution, and debt threatening both the industrial and developing worlds, the vehicle of the future clearly rides on two wheels rather than four. The bicycle's ascent would not eliminate automobiles, or any other vehicle, but would instead integrate bicycles with cars and mass transit. A well-balanced, diverse transport system could help save precious oil and other resources, reduce pollutants, and provide mobility to people with few or no alternatives to walking. Before this can happen, though, a shift in attitudes must take place.

More Bikers Than Drivers

Bicycles already outnumber cars worldwide by two to one, with most of the 800-million-bicycle fleet concentrated in the Third World, particularly China and India. In the United States, where one of every two people owns an automobile, bicycles are mainly used for recreation or, at

best, supplementary transportation. At the other extreme is China, with one privately owned car for every seventy-five thousand people. Chinese commuters have little choice but to make the most of their bikes.

By bicycle standards, China is in a class by itself, with some 270 million bicycles, or roughly one for every four people. In urban areas, half the residents have bicycles. Traffic monitors at an intersection in the northern industrial city of Tianjin once counted more than fifty thousand bicycles pass in an hour.

The bicycle fleet in China has nearly tripled since 1979, largely as a result of rising incomes. Domestic bike sales in 1987 reached thirty-five million units, actually exceeding total worldwide automobile sales. Bicycles are popular in China because, like cars in industrial countries, they offer the luxury of individual mobility and independence, and door-to-door travel without detours or extra stops for other passengers. When the same trip would take equal time by bicycle or mass transit, Chinese prefer to bike.

Bicycles are also popular because Chinese transportation planners in the sixties and seventies used subsidies, paying commuters a monthly fee for bicycling to work, to relieve the pressure on crowded buses and to postpone public transit investment. This policy, however, failed to foresee the bicycle boom of the eighties.

Cycle trishaws in Canton (Guangzhou), China

Now Chinese cities face a phenomenon in which people's appetite for individual mobility is becoming an obstacle to mass mobility. Like car commuters in the industrial countries, bicycle commuters are now officially encouraged to use the expanded fleet of public buses for longer trips.

Bicycles transport more people in Asia alone than do automobiles in all countries combined. Throughout the continent, ingeniously rigged two- and three-wheelers accomplish much of what automobiles do elsewhere. With the help of trailers, baskets and load platforms, pedal power hauls everything from sacks of rice to piles of bricks. Cycle rickshaws are the taxis of Southeast Asia, while sturdy tricycles are the light trucks that haul loads of up to half a ton. In Bangladesh, cycle rickshaws transport more tonnage than all motor vehicles combined.

In urban areas, bicycles are the primary means of commuting. In the countryside, they help peasants drastically cut down on the time needed to transport water and fuelwood. In many Asian cities, two-thirds of the vehicles on the road during rush hours are bicycles.

Shunned, Feared and Neglected

The rest of the developing world lags far behind Asia in using bicycles. Particularly in Latin America, the prestige and power of auto ownership has hypnotized governments into ignoring pedal power and led citizens to scorn the bicycle as a vehicle for the poor.

African farmers depend heavily on bicycles, but relatively few urban residents do. The few who are able to buy a bicycle are discouraged by official disdain or even bans on their use. In some African countries it is taboo for women, the main haulers of food, water, fuel and children, to ride bicycles.

Several heavily polluted Eastern European countries are taking modest steps to expand the bicycle's role in easing the burden on the environment. In Poland, a plan for a bicycle system in the city of Poznan calls for a 124-mile network of bicycle paths by 1990. Bicycle production in Poland has more than doubled in the last two decades, and demand still exceeds supply. In 1979, the Lithuanian city of Siauliai launched a comprehensive program to encourage cycling, the Soviet Union's first, which included a bicycle-path system and extensive parking facilities.

A surprising share of the world's bicycles is found in developed countries, surprising, only because of the small number found on typical city streets. In several European countries, among them Denmark, West Germany and the Netherlands, there are more bike owners than nonowners. The United States had some ninety-five million bicycles in

1985, second only to China. Bicycle ownership in the industrial world does not necessarily mean bicycle use. One in four Britons has a bicycle, yet only one transport trip out of thirty-three is made by bike. Only one out of fifty bicycles in the United States is used for commuting; most of the rest are ridden by children and sports enthusiasts, or collecting dust in the basement.

A comparison of bicycle and automobile ownership by country shows the relative dependence on the bicycle (see Table 1). The United States, for example, has more than twice as many bicycles as India, but only a fraction of American bicycles get as much use. India's growing middle class of office and factory workers is more likely to get to work by bicycle than any other form of transport.

Table 1. Bicycles and Automobiles in Selected Countries, circa 1985 (In Millions)

Country	Bicycles	Autos	Cycle/Auto Ratio
China[1]	300.0	1.2	250.0
India	45.0	1.5	30.0
South Korea	6.0	.3	20.0
Egypt	1.5	.5	3.0
Mexico	12.0	4.8	2.5
Netherlands	11.0	4.9	2.2
Japan[1]	60.0	30.7	2.0
W. Germany	45.0	26.0	1.7
Argentina	4.5	3.4	1.3
Tanzania	.5	.5	1.0
Australia[1]	6.8	7.1	1.0
U.S.[1]	103.0	139.0	.7

Sources: Worldwatch Institute, based on Motor Vehicle Manufacturers Association, *Facts and Figures* (Detroit, Mich: various editions); MVMA, various private communications; United Nations, *Bicycles and Components: A Pilot Survey of Opportunities for Trade Among Developing Countries* (Geneva: International Trade Centre UNCTAD/GATT, 1985); *Japan Cycle Press International*, various editions; and other sources.

[1]1988

Bike lane and sign showing the way to the rail station, Karlsruhe, West Germany

Planning Makes a Difference

Like the United States, most other industrial countries have all but abandoned the bicycle for the automobile. Suburbanization has sprawled jobs, homes and services over such long distances that automobiles are less a convenience than a necessity. Only a handful of North American cities have extensive bike paths, and most major cities have become bicycle-proof, their roadways and parking facilities designed with only motor vehicles in mind.

Three outstanding models of nationwide bicycle planning are the Netherlands, West Germany and Japan. Local governments in these countries, spurred by traffic jams and air pollution, are demonstrating how public policy can be used to make cycling a safe and convenient alternative to the car.

The Netherlands has over nine thousand miles of bicycle paths, more than any other country. In some Dutch cities, half of all trips are made by bike. The West German town of Erlangen has completed a network of paths covering one hundred miles, about half the length of the city's streets. Bicycle use has more than doubled as a result.

Bicycle-oriented cities in Europe and Japan have boosted both bicycle and public transit ridership with facilities for carrying bicycles on buses and trains, and for parking them safely at stations. So many Japanese commuters take

advantage of this bike-to-rail option that train stations need parking towers. The city of Kasukabe now has a twelve-story structure that uses cranes to park over fifteen hundred bicycles.

Most Efficient Vehicle Ever Built

Renewable fuels are a hot topic in transportation circles today, with concern deepening over dependence on scarce and expensive oil. In the rush to run engines on gasoline alternatives such as corn-based ethanol, transportation planners have overlooked a technology that converts food directly into fuel. A biker can ride three and one-half miles on the calories found in an ear of corn, and there is no distilling or refining involved.

Bicycles consume less energy per passenger mile than any other form of transport, including walking (see Table 2). A ten-mile, round-trip commute by bicycle requires 350 calories of energy, or three-quarters of a cup of macaroni. The same trip in the average American car uses more than half a gallon of gasoline.

Table 2. Energy Intensity of Selected Transport Modes, U.S., 1984

Mode	Calories Per Passenger Mile
Bicycling	35
Walking	100
Transit rail	885
Transit bus	920
Automobile, one occupant	1,860

Sources: Mary C. Holcomb et al., *Transportation Energy Data Book, Edition 9* (Oak Ridge, Tenn., Oak Ridge National Laboratory, 1987); President's Council on Physical Fitness and Sports, private communication, June 23, 1988.

A look at national fuel bills makes a strong case for using bicycles. In 1987, U.S. oil imports cost $43 billion, or nearly a quarter of the country's $171 billion trade deficit. Of the country's total annual oil consumption, nearly two-thirds is burned up in transportation. With world oil production declining, a country's car dependence heightens its vulnerability to impending oil price hikes.

The debt-ridden Third World is especially burdened by foreign oil dependence. Several developing countries already spend one-third to one-half of their export earnings on imported petroleum, on average about half of it going to the transport sector. By shifting to nonmotorized transport where possible, debtor nations could free their financial resources for other investments.

In 1986, a national campaign in the Netherlands encouraged drivers to switch to bicycles for trips within a three-mile radius of home. Policymakers figured this would save each motorist at least $400 a year in fuel costs. A 1980 study in Great Britain calculated that if just ten percent of car trips under ten miles were made by bicycle, the country would save fourteen million barrels of oil a year.

A 1983 study of American commuters revealed that just getting to public transit by bicycle instead of car would save each commuter roughly 150 gallons of gasoline a year. When a motorist who otherwise drives all the way to work switches to this bike-and-ride method, his or her annual gasoline use drops by some four hundred gallons, half the amount consumed by the typical car in a year. If ten percent of the Americans who commute by car switched to bike-and-ride, more than $1.3 billion could be shaved off the U.S. oil import bill.

Urban Bane

In 1983, a unique experiment began to unfold in the streets of Bogota, Colombia. Every Sunday morning thirty-seven miles of arterial roads were closed to motor traffic

Man on a bike in Nicaragua

and half a million city dwellers took to the streets to bicycle, roller skate and stroll. Now in its sixth year, the weekly ritual transforms a cityscape dominated by smog and honking cars into a tranquil, clean environment.

The world's automobile-bound cities, though, are a far

cry from Bogota on Sunday. Dependence on the car exacts a toll on human health, the environment and quality of life in urban areas.

Industrial world cities typically relinquish at least one-third of their land--two-thirds in Los Angeles--to motor vehicles in the form of roads and parking lots. In the United States, this totals 38.4 million acres, more area than the entire state of Georgia. Researchers George Work and Lawrence Malone have compared the space demands of various vehicles, and according to their calculations, for a bridge of a given size to accommodate forty thousand people in one hour would require twelve lanes for cars, four lanes for buses, two for trains, and one for bicycles.

With mounting pressures on Third World countries to house and feed their swelling populations, they have little room to spare for roads and parking lots. Where people and good cropland are concentrated in a relatively small area of a country, as in China, choices are narrow. If China had the same car ownership rate as the United States--one car for every two people--it would need to devote around eighteen million acres to parking facilities alone, an amount equal to eight percent of the country's arable land.

The automobile is very much the victim of its own success, jamming urban centers and suburbs alike. Traffic congestion is eroding the quality of life in urban areas, and the amount of time wasted in traffic continues to expand in the world's cities. London rush-hour traffic crawls at an average of eight miles an hour. In Los Angeles, motorists waste 100,000 hours a day in traffic jams. Traffic engineers estimate that by the turn of the century, Californians will lose almost two million hours daily.

Urban residents from Sao Paulo to London face eye, nose, and throat irritation, asthma, headaches, and chest discomfort brought on by car-produced smog. Emissions from gasoline and diesel fuel use are annually linked to as many as thirty thousand deaths in the United States alone. It is short automobile trips--precisely the ones bike-riding could replace--that create the most pollution, because a cold engine does not fire effectively and releases unburnt hydrocarbons into the air. In the United States, where an estimated forty percent of urban commuters drive less than four miles, pedaling to work would have a dramatic effect on air quality.

Both city and country dwellers are endangered in other ways by the automobile. Some 100,000 people in North America, Western Europe, Japan and Australia died in traffic accidents in 1985. Developing countries--with fewer automobiles but more pedestrian traffic and no provisions for separating the two--have fatality rates as much as twenty times higher than industrial countries.

Bicycle riding is not without its risks. Bicycle accidents do account for many traffic injuries, particularly in Asia, but are unlikely to kill people unless motor vehicles are involved. But that is small consolation for would-be bicyclists who are intimidated off the road.

Latin America has its urban cyclists--including young boys delivering newspapers and craftspeople hauling goods--but many potential riders are deterred by dangerous traffic conditions. Nairobi streets that once were full of bicycles now are only safe for cars.

Where it can be done safely, cycling improves public health. The popularity of stationary exercise bikes is proof that people enjoy cycling to keep fit; the irony is that so many people drive to the health club in order to ride them. Cyclists are less vulnerable to heart attacks or coronary disease than sedentary commuters, and they arrive at work more alert and less stressed by rush-hour traffic.

An Equitable Technology

Bicycles have a hard time getting the respect they deserve, even in countries where they give crucial mobility and employment to millions. The city of Jakarta, Indonesia, for example, has confiscated tens of thousands of cycle rickshaws over the past several years and dumped them into the sea in order to "reduce traffic congestion." Last year more than 100,000 pedicab drivers in Dacca, Bangladesh faced a potential ban of their pedal-powered cabs for safety reasons.

Public buses are the main mode of transport in most developing countries and often the only one poor people can afford. But transit systems have proved incapable of keeping pace with explosive urban growth rates.

Even where mass transit systems are adequate, they do not serve certain crucial needs. A passenger bus cannot haul a Ghanaian farmer's produce to market, or carry a Colombo street vendor's hot lunches to a factory. Nor can it help rural people who live a day's walk from the nearest road. With bicycles, the poor and unemployed can earn a living by getting homemade crafts to urban markets, vending wares in the streets, or taking passengers for hire.

A bicycle demands a tiny fraction of the capital necessary to own and operate an automobile. In Brazil, the least expensive domestic car costs an average worker roughly six years' wages, while a bicycle requires nearly six weeks' pay.

Though many of those who would most benefit by a bicycle are too poor to own one, the bicycle is still the cheapest mode of transport outside urban cores. Governments could encompass rural areas in their transport planning by subsidizing bike purchases, a much less costly approach than extending roads and bus lines. In addition, bicycle production is a low-risk venture for developing countries that have little or no industrial base.

A small assembly plant and repair shop can run on about $200 worth of tools. One hundred bicycles can be manufactured for the materials it takes to build a medium-sized car.

India has demonstrated how a nearly self-sufficient bicycle industry can be created by first assembling bicycles with imported parts, then producing frames in local workshops and gradually establishing small factories to produce parts domestically. From a modest beginning five decades ago, India has become a major world producer, second only to China. It directs more than ninety percent of its bicycle exports to other developing countries, and through joint-venture and license agreements is sharing its small-scale, labor-intensive techniques with countries throughout Asia, Africa, and the Caribbean.

Subsidized Auto Dependency

The economic and environmental consequences of automobile overdependence may eventually necessitate bicycle use, even without government help. But for now, public policies that ignore bicycles perpetuate private attitudes against using them. Thus, the transport planner's office seems the best place for the philosophical reordering to start.

A major barrier to bicycling is the fact that drivers are in effect paid to use automobiles. Drivers in the United States may receive as much as $300 billion in subsidies each year

Bike lanes in Tokyo, Japan are separated from traffic lanes by planters.

in the form of public funds to pay for road repair and construction, police and fire services, and health care.

In the private sector, free parking provided by many employers in effect pays the gasoline costs of commuting. The U.S. Environmental Protection Agency has concluded that if employees were directly handed this subsidy, public transit ridership and bicycle use would go up, while auto traffic would decline by twenty-five percent.

Several cities have made motorists pay for the privilege of driving automobiles. Singapore charges private cars carrying fewer than four occupants "congestion fees" for entering the downtown area during rush hours, a decade-old scheme that has raised downtown traffic speeds by twenty percent and reduced traffic accidents by twenty-five percent.

Inconvenience--a general absence of safe parking and locker room facilities--keeps many commuters from bicycling to work, but there are precedents for dealing with this. In China, bicycle parking lots are guarded against theft by attendants. Palo Alto, California has successfully passed a number of innovative regulations requiring builders of large offices to provide showers and bicycle parking.

Table 3. Production of Bicycles and Automobiles, Selected Countries, 1987 (In Millions)

Country	Bicycles	Automobiles
China	41.0	.00[1]
Taiwan	9.9	.20
Japan	7.8	7.89
U.S.	5.8	7.10
USSR	5.4[2]	1.33
India	5.3	.15
W. Germany	2.9	4.37
South Korea	2.6	.79
Brazil	2.5	.68
Italy	1.6	1.71
Poland	1.3	.30
U.K.	1.2	1.14
Canada	1.2	.81
Others	10.5	6.54
World Total	99.0	33.01

Sources: Worldwatch Institute, based on Motor Vehicle Manufacturers Association, *Facts and Figures '89* (Detroit, Mich.: 1989); *Japan Cycle Press*, various editions; and other sources.

[1] In 1987, China produced 4,045 automobiles.
[2] 1986 estimate.

All that aside, commuters are still not likely to choose bicycling when it means taking their lives into their hands on busy city streets. In some situations, effective bicycle promotion calls for bike paths separate from roads and space on regular roadways devoted to bicycles. More importantly, though, traffic management and driver training should reflect bicycles' role as legitimate vehicles. Along with public education campaigns on safe bicycling, these steps can elevate bicycling to the status of real transportation in the public's mind.

Pedaling Into the Future

In terms of sheer number of vehicles, the world is well-equipped to let bicycles take on a larger share of the transportation burden. Around the world, nearly 100 million bicycles are made each year--three times the number of automobiles (see Table 3). The big bicycle producers, especially in Asia, are sure to keep upping their capacities.

With or without bike-oriented planning, financial imperatives may force a shift to the bicycle. For starters, most people in the world will never be able to buy an automobile, and public transit systems in many cities cannot keep pace with explosive population growth. When the next oil crunch hits, perhaps within the next decade, even those who can now afford to drive will be looking for alternatives. With relatively modest public investment in parking and road space for bicycles, transportation choices would multiply quickly.

Environmental degradation may also change planners' thinking. The by-products of fossil fuel combustion--deadly urban air pollution, acid rain on lakes and forests, and global warming--as well as the paving of valuable land, point to the need for an alternative to engines. The bicycle is the only vehicle that can help address all of these problems and still provide convenient and affordable personal transportation.

While transport planners remain fixated on the auto, congestion and commuting costs are already spurring people to switch to bicycling. The number of bicycle commuters in the United States reached 2.7 million in 1988, which is still less than 3 percent of all commuters, but represents more than a quadrupling in one decade. This happened with virtually no public policy push, suggesting that official encouragement could inspire a more dramatic changeover.

Just how rapidly the bicycle will expand transport options, check environmental damage, and restore urban quality of life depends on how quickly it moves from individual preference onto the public agenda.

Marcia D. Lowe is a researcher at the Worldwatch Institute.

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Solid Waste Resource Center Offers Timely Information

The Solid Waste Resource Center, located in Asheville, N.C., is a new information clearinghouse for solid waste planning. The Center was established by the Land of Sky Regional Council, through a grant from the Tennessee Valley Authority, in response to the growing needs of local governments, development districts, and others who need timely information on all aspects of solid waste management.

The council maintains a solid waste library, and a weight and composition database developed during one and one-half years of field work with member communities in North Carolina's Region B planning area. The Center provides a means for the Council to share its experience and knowledge with others inside and outside the region.

To use the Resource Center, write or call with your request or question. Council staff will provide consultation over the phone to narrow down requests, and will help you find the information you need, or refer you to the appropriate resources. Staff consultation and library use are free. Charges are made only for actual cost of printed materials, or database searches.

The Center maintains a large collection of periodicals and also has some videos on selected topics. A resource list is available free of charge from the Land of Sky Council. This list is updated twice a year, as new materials are received. The current list of topics covered by the library includes:

- General Solid Waste Management
- Education and Public Involvement
- Weight and Composition Studies
- Pollution Prevention Pays
- Incineration and Waste-to-Energy
- Household Hazardous Wastes
- Used Oil and Tires
- Recycling
- Landfilling
- Composting

The model solid waste planning process developed out of this experience is outlined in the recently published *Solid Waste Planning Manual.* For more information, contact Robin Sexton at the following address: Solid Waste Resource Center, Land of Sky Regional Council, 25 Heritage Drive, Asheville, North Carolina 28806, (704) 254-8131.